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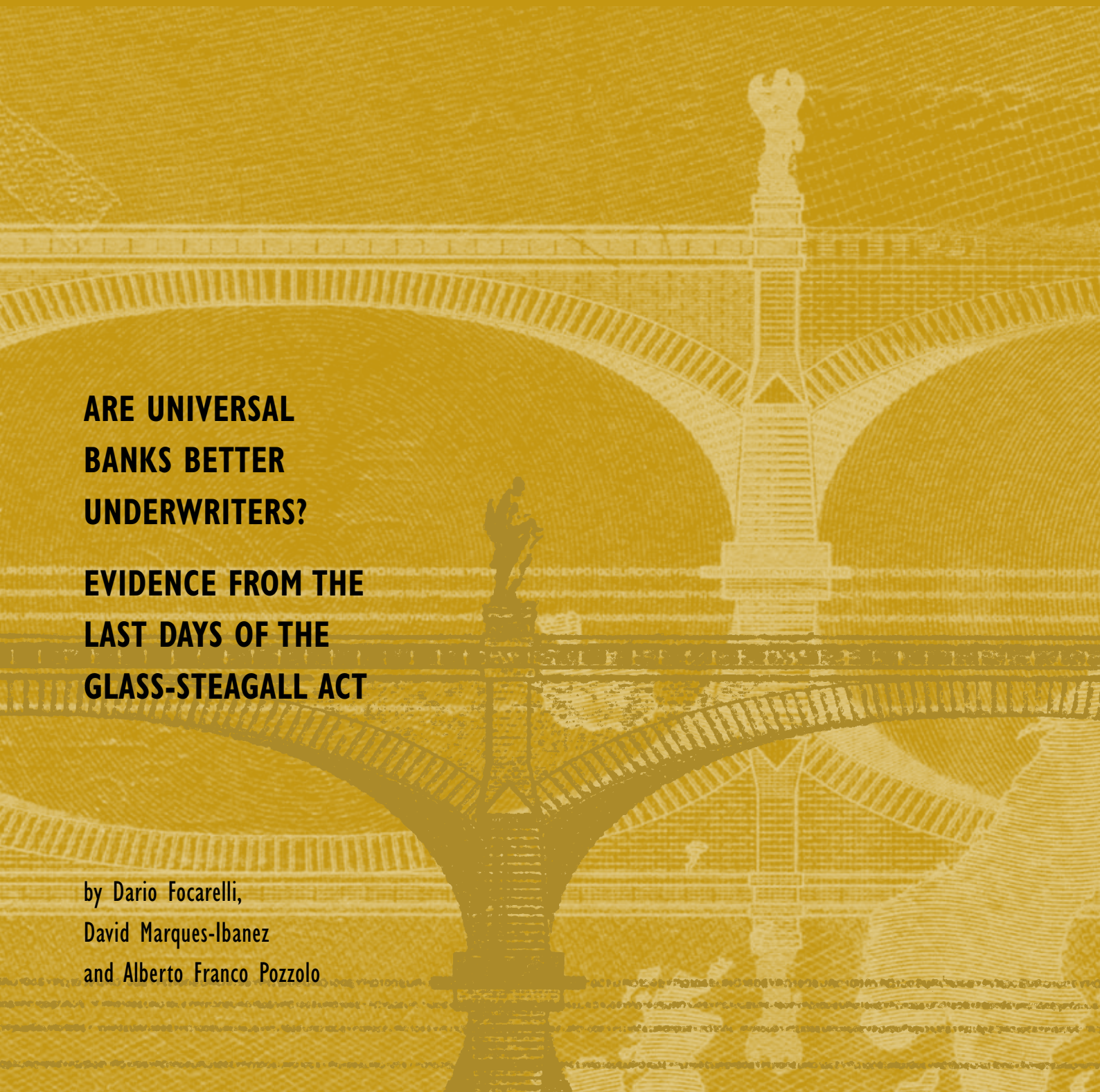

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Abstract: It has often been argued during the recent credit crisis that commercial banks' involvement in investment banking activities might have had an impact on the intensity of their underwriting standards. We turn to evidence from the period prior to the complete revocation of the Glass-Steagall Act in the United States and analyze whether investment banks or – section 20 subsidiaries of – commercial banks underwrote riskier securities. We compare actual defaults of these deals for an extensive sample of about 4,000 corporate debt securities underwritten during the period of the de facto softening of the Act's restrictions. Securities underwritten by commercial banks' subsidiaries have a higher probability of default than those underwritten by investment houses. This evidence is stronger in the case of ex-ante riskier and more competitive issues, and during the first years of bank securities' subsidiaries' entry into the market. Based on our results, it is not possible to reject that the repeal of the Glass-Steagall led to looser credit screening by broad (universal) banking companies trying to gain market share and/or to the lower initial ability of these banks to correctly evaluate default risk.

Keywords: Glass-Steagall Act, securities underwriting, default, investment banking.
JEL-classification: G21, G24, N22.

Non-technical summary

Over the last 30 years there has been a profound deregulation of investment banks' activities in the United States which lead to the creation of large financial institutions with a wide range of banking business. One of the most notorious examples of regulation setting up restrictions on banks' business models was the banking Act of 1933, commonly known as the Glass-Steagall Act, which imposed a functional separation between commercial and securities activities. At the time, the enactment of the Glass-Steagall was to a large extent motivated by concerns about conflicts of interest between the lending, underwriting and proprietary trading functions.

In the last decades of its existence the Glass-Steagall was progressively relaxed. In April 1987 the Fed allowed US commercial bank holding companies to establish affiliates which authorized to underwrite certain corporate securities. Finally, in 1999, the Glass-Steagall Act was formally repealed.

The dismantling of the Glass-Steagall Act was based on three main arguments. First, its revocation would allow banks to attain favorable economies of scope. Second, it would help banks to achieve greater opportunities for diversification derived from the different business lines with heterogeneous revenue cycles. Third, the repeal of the constraints introduced by the Glass-Steagall Act was expected to enhance the ability of US financial institutions to compete with foreign universal banks.

The rescission of the Glass-Steagall prohibitions was also buttressed by increasingly persuasive evidence from academic studies of the impact of broad banking on the pre-Glass-Steagall era. They consistently showed that securities underwritten by commercial banks' subsidiaries did not have a higher probability of default than those underwritten by investment banks.

We revisit the issue and present new empirical evidence on the impact of banks' business models on credit screening of corporate bonds. We examine empirically about 4,000 corporate bonds underwritten by investment houses and commercial banks' subsidiaries during the period of the progressive repeal of the Glass-Steagall (between 1991 and 1999) in the United States and analyze their ex-post credit quality using a unique data base of corporate defaults running until the end of 2008.

We find that over the ten years of the progressive repeal of the Act, debt securities issues underwritten by commercial banks had a higher probability of default than those underwritten by investment houses, the more so in the case of ex-ante riskier and more competitive issues, and during the first years of bank subsidiaries entry into the market. Based on our results, it is not possible to reject that the repeal of the Glass-Steagall led to looser credit screening by broad (universal) banking companies, although this seems to be due to banks' relative more aggressive underwriting standards in order to gain market share and/or the lower initial ability of these banks to correctly evaluate default risk rather than to conflicts of interest between the lending and underwriting functions. Our results do not question the elimination of the barriers between investment and commercial banking proposed by the Glass-Steagall Act. Rather, they point to the possibly perverse effects of allowing for increased competition without complementing it with more intensive scrutiny at the banking supervisory level.

I. Introduction

Over the last 30 years there has been a historical liberalization of banking markets in the United States. This liberalization included a "de facto" profound deregulation of investment banks' activities which lead to the creation of large financial institutions with a wide range of banking business. While there have been a number of drivers of the financial crisis,[1] there has been a renewed interest – mostly from a financial stability perspective – on reassessing the usefulness of regulations imposing a functional separation between commercial and investment banking activities.

One of the most notorious examples of this regulation is the banking Act of 1933, commonly known as the Glass-Steagall Act, which abolished the securities affiliates of commercial banks (henceforth denoted as "banks" or "commercial banks" as opposed to "investment houses") and imposed a separation or "firewall" between commercial and securities activities. At the time, the enactment of the Glass-Steagall was to a large extent motivated by concerns about the role of banks in the run up to the great depression and in particular about conflicts of interest between different banking activities and, in particular, between the lending, underwriting and proprietary trading functions.[2]

In the last decades of its existence the Act was progressively relaxed. In April 1987 the Fed allowed US bank holding companies to establish affiliates which authorized to underwrite certain corporate securities. Finally, in 1999, the Glass-Steagall Act was formally repealed with the passing and enactment of the Gramm-Leach-Bliley Act in 1999. At the time, three main arguments were put forward the repeal of the Glass-Steagall Act (Santos, 1998; Barth et al., 2000).

First, it would allow banks to attain favorable economies of scope. That is, for banks certain fixed costs of collecting, processing and assessing information or distributing financial services can be used across a range of financial services. These economies of scope were expected to enable financial holding companies to earn higher profits and pass along lower prices and to offer more product and service choices to their customers. In this respect, Kanatas and Qi (1997) analyze the trade-offs between the benefits derived from scope economies and the possible conflicts of interest and show that if commercial banks are allowed to underwrite securities, their economies of scope may enable them to gain all of the underwriting business of their loan customers by lowering credit standards.

Second, the dismantling of the Act was expected to allow banks to achieve lower levels of risk due to greater opportunities. These diversification opportunities for diversification

[1] They include, more prominently, financial innovation, the degree of competition in the banking system, external financial imbalances, the level of private sector debt, corporate governance in the banking sector, the relative tightness of monetary policy and the intensity of banking supervision among others (Acharya and Richardson, 2009).
[2] The separation of commercial and securities business was not a new idea. In fact it was the norm in many countries and had been American law and custom until the turn of the twentieth century, when securities affiliates of deposit taking institutions were allowed to operate (Mayer, 2009, and Gerschenkron, 1962).

derived from the different business lines with different revenues cycles were expected to translate in a lower profit variance for a broad banking company than for more specialized institutions (Cornett et al., 2002). Third, the repeal of the constraints introduced by the Glass-Steagall Act was expected to enhance US financial institutions' ability to compete with foreign universal banks.[3]

The repeal of the Glass-Steagall prohibitions was also supported by the increasingly persuasive evidence from academic studies of the impact of broad banking on the pre-Glass-Steagall era (Barth et al., 2000). Most empirical studies used data from the 1920s in the US (i.e. the pre-Glass-Steagall era) and showed that issues underwritten by the securities' subsidiaries of commercial banks did not have a higher probability of default than those underwritten by investment houses (Puri, 1994; Kroszner and Rajan, 1994).[4] In addition, securities underwritten by commercial bank subsidiaries at the time paid lower spreads, suggesting that investors recognized the stronger certification ability of commercial banks (Puri, 1996). Clearly, until very recently, the existence of the Glass-Steagall Act rendered it impossible to conduct a research on contemporary US firms using actual information on securities' defaults. This is the object of our research.

The role of banks' business models and their possible impact on the intensity of credit screening has become again a widely debated issue during the recent credit crisis. As a result, 10 years after the final repeal of the Glass-Steagall Act the separation between commercial banks and securities business is back into the political agenda.[5] A notorious, although very partial, reminiscent of the Glass-Steagall Act has been the so called "Volcker Rule", which was included in the Do Dodd–Frank Wall Street Reform and Consumer Protection Act signed into law by President Barack Obama on July 21, 2010.

We revisit the issue and present new empirical evidence on the impact of the functional separation of banks' business model on credit screening of corporate bonds. We examine 3,943 corporate bond issues underwritten by investment houses or commercial banks' subsidiaries during the period of the progressive repeal of the Glass-Steagall (between 1991 and 1999) and analyze their quality using a unique data base of corporate defaults running until the end of 2008. We find that debt security issues underwritten by commercial banks had a higher probability of default than those underwritten by investment houses.

Our results are in contrast with the so called "certification hypothesis", positing that commercial banks can benefit from informational economies of scope and therefore are in a

[3] This argument was often and empathically put forward politically (see Wilmarth, 2009).
[4] During the Nineties, a number of studies compared the characteristics of securities underwritten by commercial and by investment banks, respectively. A brief discussion is presented in section 2; a richer survey is in Crockett et al. (2003) and Morrison (2009).
[5] See for instance Senators' Cantwell and McCain legal initiative to reinstate the Glass-Steagall separation, which echoed proposals by senator Hinchey of New York as well as Exchange Commission ex-chairman Arthur Levitt ("An Odd Post-Crash Couple Spurning Obama, McCain and Cantwell propose resurrecting Glass-Steagall to break up Wall Street", Newsweek, 15th December, 2009).

better position than investment houses to correctly evaluate the securities that they underwrite.

We test two alternative explanations of our findings. First, based on the very rationale for the Glass-Steagall Act, we verify if they might be due to the presence of conflicts of interest derived from engaging simultaneously in lending and underwriting functions. Second, the pro-competitive effects of opening-up the security underwriting business and we analyze if commercial banks might have relatively lowered the underwriting standards and/or underestimated the securities' default risk, in their search for market share. We call the first the "conflicts of interest" hypothesis and the second the "risk underestimation" hypothesis.[6]

Our analysis points towards the second explanation. Securities issues underwritten by commercial banks have a higher probability of default particularly if they are ex-ante more opaque and riskier, if they are more competitive (i.e., if during the sample period the issuers used both banks and investment houses as underwriters; Kang and Liu, 2007), and if they are issued during the first part of our sample period. This is consistent with the hypothesis that the higher default rate was probably due to an underestimation of default risk on more opaque and contested issues, by part of new entrants into the market relatively lowering underwriting standards. In line with previous literature (Puri, 1996), we find instead very weak evidence consistent with the "conflict of interests" hypothesis. Our results do not question the elimination of the barriers between investment and commercial banking proposed by the Glass-Steagall Act. Rather, they point to the possibly perverse effects of allowing for increased competition without complementing it with more intensive scrutiny at the banking supervisory level.

The paper is organized as follows. Section 2 briefly describes the institutional environment in the U.S. market for corporate securities underwriting since the introduction of Section 20 subsidiaries. Section 3 briefly surveys the relevant literature. Section 4 describes the data used in the empirical analysis and presents some preliminary evidence based on the descriptive statistics. Sections 5 and 6 present the results of the econometric analysis. Section 7 concludes.

II. The institutional framework

The separation of commercial and investment banking (also called security business) activities has been the norm and custom in United States until the turn of the twentieth century. On the back of the stock market boom of the 1920s, commercial banks swarmed into the securities underwriting business. The McFadden Act in 1927 expressly allowed securities departments of national banks to underwrite securities (Peach, 1941). Prior to that, national banks were, in

[6] Conflicts of interest in the financial sector arise when a party to a transaction can gain by taking actions which are detrimental to its counterparty (see, Mehran and Stultz, 2007, and Crockett et al., 2003). The risk underestimation hypothesis is consistent, but not directly applicable, with theories suggesting that strategic interaction among asymmetrically informed banks may them to behave more aggressively and loose lending standards (Rajan, 1994, Ruckes, 2004, Dell'Ariccia and Marquez, 2006, and Gorton and He, 2008).

principle, barred from entering into the securities business. Yet in practice national banks were able to operate in the securities business by creating affiliates.[7] As a result, by 1929 these affiliates had attained half of the underwriting business in the United States.

The public outcry about the possible role of banks in the stock market crash of 1929 produced concerns about mixing investment and commercial banking activities.[8] This mood against the involvement of banks in securities business led to a Senate Banking and Currency Committee inquiry known as the Pecora committee, to ascertain conflicts of interest in the banking industry. The results showed indication of abuses by banks' securities affiliates and were cited by advocates of the Glass-Steagall Act, that was then passed in 1933. The Act banned banks from underwriting, holding or dealing in corporate securities, either directly or indirectly via securities affiliates. In particular, Section 20 of the Act ordered that: *"no member bank could be affiliated with any corporation, association or business trust engaged principally in the issue, flotation, underwriting, public sale, or distribution at wholesale or retail through syndicate participation of stocks, bonds, debentures, notes or other securities"*.[9]

Economically, one prime example of the possible conflicts of interest when marrying securities and commercial banking business is the possibility that universal banks might underwrite and push low-quality securities to investors (Morrison, 2009).[10] This would of course imply the existence of 'naive' investors – using the definition coined by Kroszner and Rajan (1994) – who would, in turn, buy these securities. Hence such a distinction between investment houses and banks implicitly suggests that they have different clienteles, who may in turn deserve different degrees of protection.[11] A problem with this interpretation is that it requires that investors are irrational and do not learn from past experience (Puri, 1999).

Another major argument supporting the functional separation provided by the Glass-Steagall Act was related to financial stability considerations. Namely, to keep deposit-taking institutions with access to the deposit insurance facilities out of activities that might lead to higher risk-taking and threaten the stability of the banking system (Freixas et al., 2007). The related possibility of facilitating "Too-Big-to-Fail (TBTF) Status" probably also supported the separation of business models as proposed by the Glass-Steagall Act. That is, the idea that the bankruptcy of certain very large and complex banks would be too harmful to the operation of the economy to be allowed to fail. This could exacerbate moral hazard problems possibly

[7] The Comptroller of the Currency ruled in 1902 that national banks were not allowed to engage in the securities business. Yet many banks were able to circumvent this rule by creating securities affiliates as state banks with their own capital, owned by the shareholders of the national bank (Morrison, 2009).
[8] See Willis and Chapman (1934) and Kennedy (1973).
[9] For a careful analysis of the institutional environment in the pre-Glass-Steagall period see Peach (1941), Carosso (1970), Kennedy (1971), Kelly (1985a), and Benston (1990).
[10] A contrary thesis is that the banks are better informed than investment houses on the financial conditions of their clients and are thus able to provide better certification of the securities that they underwrite.
[11] From this perspective the rationale for banning commercial banks from the underwriting business is in fact to be found in the need to protect their clients, who are presumed to be less able to evaluate the quality of the security issued.

creating incentives for excessive risk-taking (and/or regulatory capture) from those institutions (Mishkin, 2006).

The last argument in favor of the functional separation is behavioral in nature. It stresses the basic incompatibility of bringing commercial banking and investment banking activities together, as their incentives are not aligned, due to differences in the type of business conducted: investment banking is mostly based on fee-seeking brokerage activities in which short-term risk taking is paramount. On the other hand, commercial banking activities mostly hinge on maturity transformation of assets based on the long-term credit screening and monitoring of borrowers (Bhattacharya and Thakor, 1993). Combining both functions under the same institutional umbrella might shorten commercial bankers' incentives, lowering the intensity of screening and the long-term monitoring of borrowers.[12] This problem has probably become more acute in recent years as banks and markets have become increasingly integrated and co-dependent (Boot and Thakor, 2009).

Between 1933 and 1963 Glass-Steagall was fully enforced.[13] During this period, US investment banks became among the most competitive in the world and the share of financial intermediation grew rapidly as financial flows progressively shifted from the balance sheets of banks and other credit institutions to the financial markets. Starting in the mid-1960s, however, banks went back to the securities business, and eventually gained court authorization to underwrite municipal bonds. At the same time they were prevented from operating in most investment banking business.

In April 1987 the Fed allowed US commercial bank holding companies to establish affiliates (so-called "Section 20 subsidiaries") which were authorized to underwrite corporate securities. Two years later these affiliates were allowed to underwrite commercial paper and in 1990 permission was extended to equities. All these activities were allowed as long as they did not generate more than 5 per cent of the bank's total revenues (the ceiling was raised to 10 per cent in 1989 and 25 per cent in 1996). Finally, in 1999 the Gramm-Leach-Bliley Financial Services Modernization Act repealed the lingering legal barriers related to banks and investment houses' business separation.

III. The literature

The progressive loosening of the Glass-Steagall constraints generated a number of empirical studies analyzing the possible benefits of separating banks and investment houses' activities. These studies resorted to the analysis of the underwriting standards in the pre-Glass-Steagall era, and scrutinized two main hypotheses. The first one was that securities underwritten by

[12] Sheng (2009). For a more detailed analysis of the main arguments see Benston (1990).
[13] The Act impacted substantially on the state of banking sector and its future evolution. For example, in the aftermath of the set up, JP Morgan was split into the Morgan Bank and what later became Morgan Stanley.

banks might be riskier because of conflicts of interest between the lending and underwriting businesses. Alternatively, securities underwritten by banks could be safer, because commercial banks might be better informed on their creditors or simply have better credit assessment abilities than investment houses and thus can provide a more credible certification of credit risk.

The theoretical literature studying the implications of the presence of banks in the underwriting business is rather limited. Rajan (2002) argues that universal banks can be in conflict with their borrowers' interests because they can extract rents from their underwriting business using the monopoly power coming from their superior information on the borrowers and issuers' quality. Kanatas and Qi (1998) show that high quality issuers may have an incentive to be separated from low quality issuers. But since this can only be done using an investment house as the underwriter, they can choose to forgo the potential benefits of informational economies of scope with the lending services. The optimal choice of a high-quality issuer depends therefore on the trade-off between the conflicts of interests' costs and the benefits from informational economies of scope. In a later paper, Kanatas and Qi (2003) add one further dimension suggesting that universal banks have lower incentives to take their creditors directly to the markets and place their securities, and therefore may hamper their use of arms-length financing. Finally, Puri (1999) shows that the entry of commercial banks in the securities business can cause banks to lower the yields for underwritten securities particularly when information collection costs are high.

The empirical literature on the role of bank in the underwriting business is much richer. In a seminal paper, Kroszner and Rajan (1994) study the characteristics of a sample of industrial bonds underwritten by affiliates of commercial banks and investment houses in the first quarters of the years between 1921 and 1929. They obtain two major findings. First, the bonds originated by banks' affiliates were ex-ante safer (they had better ratings). This suggests that markets were probably aware of potential conflicts of interest and responded by imposing a 'lemons market' discount for banks on more information-intensive issues, forcing them to underwrite mostly the safer securities. Second, non-investment-grade bonds underwritten by banks' affiliates had fewer cumulative defaults in the period 1930-1940, both in number and in total value, and investment-bank underwritten bonds defaulted earlier in their life than affiliate-originated issues. This evidence tells against the thesis that commercial banks undertaking investment banking business were systematically defrauding their clients.

Puri (1994) and Ang and Richardson (1994) refine the analysis of Kroszner and Rajan (1994) and strengthen their results. Puri concentrates on the period subsequent to the McFadden Act of 1927, which explicitly allowed banks' affiliates to underwrite corporate securities, confirming that banks'-originated issues have a lower probability of default.[14] Using a wider set

[14] Kroszner and Rajan (1994) define bond issues as underwritten by commercial banks when any such institution is included in the syndicate. Puri (1994) includes only those where the affiliate is sole or lead underwriter.

of risk measures (ex-ante yield, default experience, ex-post market prices of bonds, stock prices of issuing companies), Ang and Richardson (1994) confirm issues underwritten by commercial banks did not performed worse than those underwritten by investment houses. Puri (1996) provides evidence of the commercial banks' greater certification abilities. Comparing two samples of securities underwritten in the pre-Glass-Steagall period, she finds that on average those originated by investment houses carry higher yields, confirming that commercial banks' greater certification ability outweighs the 'lemon' discount.

An alternative explanation of Puri's evidence is that banks have greater market power relative to their less sophisticated clientele so that they can place securities at higher prices (i.e. lower yields) than investment houses. But this is at odds with Kroszner and Rajan (1997) findings' suggesting that securities issued in the pre-Glass-Steagall period by the internal departments of commercial banks – for which the potential conflict of interest is even more severe – carry higher interest rates than those underwritten by the commercial banks' securities' affiliates. By confirming that markets consider an affiliate structure as an effective commitment mechanism, this result provides indirect evidence of the market's ability to discern – and price – the possibility of conflicts of interest.

Studying the Section-20 period, Roten and Mullineaux (2002) find no evidence of differences in the yield spreads between bonds underwritten by banks and investment houses between 1995 and 1998. However, Gande et al. (1997), show that securities underwritten by Section 20 subsidiaries of bank holding companies whose commercial bank affiliate is at the same time a lender to the bond issuer (i.e., those for which the potential for conflicts of interest is stronger) have lower interest rates, and more markedly so for lower-rated issuers. Moreover, commercial banks tend to underwrite smaller issues, offering further indirect confirmation of their greater ability to acquire and process information.[15] This result is partly confirmed by Saunders and Stover (2004), who find that when the same bank acts as underwriter and credit guarantor, interest rate spreads to the issuers are lower than average. Also in this direction, Drucker and Puri (2005) show that when an underwriter lends to an issuer around the time of an IPO (a practice known as 'tying'), the firm obtains a discounted interest rate on the loan, and the discount is greater for the more information-sensitive (i.e. non-investment-grade issues), which is consistent with the certification hypothesis.[16]

Evidence from different markets and countries is more mixed.[17] Hebb and Fraser (2002) show evidence of certification effects by commercial banks when studying the Canadian

[15] Gande et al. (1999) provide further evidence on the effects of the entry of Section 20 subsidiaries in the security underwriting market, showing that they have favored the reduction of underwriter spreads and ex-ante yields, and proportionally more so for lower-rated and smaller issues.
[16] A related issue is studied by Narayanan et al. (2004), who show that, in order to signal that they are not willing to exploit potential conflicts of interest to their advantage, banks acting as underwriters to their clients predominantly co-manage with a high reputation non-lending institution.
[17] A parallel strand of literature has studied the effects of the introduction mixing commercial and investment banking on bank risk and profitability (Morrison, 2009, and Drucker and Puri, 2007).

corporate bond market. Consistent with the US results, they show that yields on issues underwritten by Canadian commercial bank affiliates are lower than those on issues originated by independent investment banks. Also in this direction, Konishi (2002) finds no differences in the initial yields in bonds underwritten by commercial banks and investment houses in Japan, but finds lower default rates for the former.[18]

Evidence consistent with the prevalence of certification over conflicts of interest comes also from IPO underwritings. Schenone (2004) and Benzoni and Schenone (2010) show that IPOs underwritten by relationship banks are relatively less underpriced, confirming that they are not perceived as riskier than those underwritten by banks that have no lending relationships with the issuer. Similarly, studying a sample of over 2,000 seasoned equity issues in the US market between 1998 and 2006, Duarte-Silva (2010) finds that those underwritten by a lending-relationship bank had systematically higher announcement returns. In contrast, Ber et al. (2001), studying the Israeli market, find that issuing firms whose equity was underwritten by a commercial bank affiliate had worse stock market performance but better accounting profitability, which suggest the existence of both a certification effect from commercial banks as well as the existence of "naïve investors".

Finally, a recent paper by Kang and Liu (2007) takes a rather different perspective, showing that banks may have conflicts of interest with the issuers, rather than with the investors. Focusing on Japan between 1995 and 1997 – after Financial System Reform Act of 1993 allowed banks to provide investment banking services – they find evidence strongly supportive of the hypothesis that banks with stronger relationships with their clients used their market power in the lending business to force the issuers to pay higher yields on their securities, so as to attract a larger number of investor and gain market shares in the underwriting business, a result consistent with the theoretical framework of Rajan (2002).

We analyze the ex-post default rates of securities underwritten by banks and investment houses in the post-Glass-Steagall period. Namely in the following, we assess the impact of the repeal of the Glass-Steagall Act on underwriting standards by investment houses compared to banks undertaking investment banking business.

IV. Data and summary statistics

We analyze all nonconvertible fixed-rate corporate bonds issued in the United States between January 1, 1985, and December 31, 1999. Our data source is the Thomson Financial Database, a private commercial dataset on securities issues that provides, among other information, date of issuance, yield to maturity, credit rating, size, maturity and issuer's sector of economic activity,

[18] Results apply to Japan before the Second World War, when commercial and investment banking were not separated.

and is compiled from regulatory filings, news sources, company press releases, and prospectuses.

Information on defaults is from Moody's Corporate Default Risk Service Database, which includes global comprehensive information on defaults since 1970 for 11,000 corporate and sovereign entities. The data is derived from Moody's own proprietary database and is updated on a monthly basis. Our sample consists of defaults between January 1985 and December 2008. In total, 356 nonconvertible bonds in our sample defaulted. While some of them were issued by the same company, not all security issues by the same firm were underwritten by the same syndicate, justifying their inclusion in the analysis as distinct events. Missed interest or principal payments made up the majority of defaults. Less frequent reasons of default are filing for Chapter 11, filing for bankruptcy, distressed exchange and grace period default.

As opposed to underwritings from investment houses, we define bank underwritings as those by one of the subsidiaries (so called "Section 20" subsidiaries) of commercial banks (i.e. deposit-taking institutions with access to deposit insurance).[19]

For the empirical analysis we exclude the period before 1991, when the number of issues underwritten by banks was insignificant. In total, we have a sample of 3,943 fixed-rate corporate bonds issued between 1991 and 1999, 842 underwritten by Section 20 subsidiaries (21.4 per cent; 28.9 per cent in dollar terms) and 3,101 underwritten by investment houses. Banks' share in the underwritings' business changed significantly over the 1990's. In dollar terms, it rose from 18.2 per cent in 1991, to 42.9 per cent in 1995, and declined again to 35.4 per cent in 1999.

The default rate is significantly higher for bonds underwritten by banks than for investment houses, both in terms of dollar and number of issues. The average default rate for issues underwritten by banks is 11.9 per cent (10.3 in dollar terms), compared to 8.3 per cent for investment houses (7.6 percent in dollar terms, showing that defaulted issues underwritten by investment houses have a smaller size than their average issue). This difference is particularly striking for lower-grade bonds – i.e., those rated Baa2 and below – while it has the opposite sign for higher-grade securities. Of the 1,995 lower-grade issues in our sample (Table 1), 1,522 were underwritten by investment houses and 473 by commercial banks (Table 2). The rate of default of issues underwritten by investment houses is 12.8 percent, much lower than the 18.2 per cent of those underwritten by banks.

[19] The Federal Reserve Board granted approval to a bank holding company to engage through a so-called Section 20 subsidiary in underwriting and dealing in securities that a member bank may not underwrite or deal in directly. Such a subsidiary is called a Section 20 subsidiary in reference to a section of the Glass-Steagall Act that limited affiliations between certain securities companies and member banks. The list of Section 20 subsidiaries is from Cornett et al. (2002).

Another striking difference is between the performance of bonds issued in the first and in the second part of our sample period, possibly due to the different macroeconomic conditions. Securities issued between 1991 and 1994 show a rate of default of 11.4 per cent, while those underwritten between 1995 and 1999 only have a rate of default of 7.3. Securities underwritten by banks had a much higher rate of default than those underwritten by investment houses (Table 1). The fact that the differences in the ex-post performance of securities issued by banks and investment houses is larger for lower-grade securities is consistent with both the conflict of interest and the "risk underestimation hypothesis". That is, due to increased competition commercial banks lowered underwriting standards to attain market share or simply due to their lower credit assessment abilities, looser standards were "ex-ante" underestimated by investors. However, the fact that the difference is lower in the second part of our sample period, when banks had already gained market shares in the underwriting business and were likely to be more cautious due to reputational issues, is more supportive of the risk underestimation hypothesis.[20]

Table 2 provides some additional evidence consistent with the risk underestimation hypothesis, showing that the difference in the default rates of securities underwritten by banks and investment houses is much starker for the sub-sample of competitive issues (i.e., those made by issuers which used both banks and investment houses as underwriters during our sample period; Kang and Liu, 2007).[21] If the reason for the higher default rate of bank underwritten issues were conflicts of interest, we would expect that banks push especially the securities issued by their longer term borrowers, for which they have most likely obtained through time a reliable set of soft information, but that are less likely to switch underwriter from banks to investment houses. In the next Section we present the results of a more formal analysis of the default probability of securities underwritten by investment houses and commercial banks.

V. Regression results

V.a Baseline specification

Our basic specification brings back the empirical methods used to analyze the pre-Glass-Steagall era. Hence we start by building on the model by Kroszner and Rajan (1994) and test whether securities underwritten by commercial banks' subsidiaries have a higher ex-post probability of default than those underwritten by investment houses. We start by estimating the following binary choice model, using a probit specification:

[20] Our data set includes relatively few instances of securities underwritten by banks that were at the same time lending to the issuers on the syndicated loan market. When excluding these issues, the patterns in the default rates of securities underwritten by banks and investment houses remain the same described above, proving that conflicts of interest cannot be taken as their unique explanation.

[21] Earlier literature shows that borrowers issuing securities tend often to hire the same investment bank often demanding exclusivity in the bond market (Yasuda (2005)) and to lesser extent in the equity market (Ljungqvist, Marston, and Wilhelm (2006))

$$Pr\,(Y_{i,j,t} = k) = f\,(X_{i,t}, D_j, Z_i, T_t),\ k = 0, 1; \quad (1)$$

where: $Y_{i,j,t} = 1$ if security issue i underwritten by bank j at time t defaulted before maturity and $Y_{i,j,t} = 0$ otherwise; $X_{i,t}$ are characteristics of the issue i at time t (i.e., size, rating, maturity, gross spread over benchmark, issuer's sector of economic activity); D_j is a dummy taking the value of 1 if there is at least one Section 20 subsidiary among the banks leading the underwriting syndicate; Z_i is a set of dummies for the sector of economic activity of the issuer; T_t are year dummies. Unlike Kroszner and Rajan (1994), we also include information on the issue's gross spread, to account for a higher probability of default known to investors at the time of the issue but not included on the rating and other issue characteristics.[22] All standard errors are calculated using the procedure of White (1980) to correct for heteroskedasticity and clustering at the issuer level to account for the fact that the behaviors of bonds issued by the same borrower are not independent.

Panel A of Table 3 reports the results of the estimation of the basic specification for equation (1). The regression includes time and industry dummies, as well as the issue's size, gross spread with respect to the benchmark, maturity and rating. Estimates are conducted on a sample of 3,279 security issues, from 1991 to 1999.[23]

The coefficient of the dummy variable for issues underwritten by commercial banks is consistent with the hypothesis that securities issues underwritten by commercial banks have a higher probability of default. That is, on average, issues underwritten by commercial banks have a higher probability of underwriting a security that eventually went into default. This result reinforces what was already apparent from the descriptive statistics, since the higher default probability is confirmed also after controlling for the characteristics of the deal, issuer and macroeconomic characteristics. The additional controls show that the size of the issue has no impact on its default probability. On the contrary, securities with higher yields have a higher default probability, even after controlling for rating and duration.

In Panel B we have distinguished between high-grade (i.e. low level of credit risk) and low-grade (i.e. higher level of credit risk) securities, including an interaction term. High-grade ratings are those classified by Moody's between Aaa and Baa1. Low-grade ratings are those classified by Moody's as Baa2 and below. The coefficient of the interaction term between the dummy for banks and that for lower-grade securities is positive, significantly different from zero, and relatively large. On the contrary, the coefficient of the interaction term between the dummy for banks and that for higher-grade securities is negative, but it is not statistically

[22] Identical results are obtained excluding the gross return from the set of the explanatory variables.
[23] Of the total number of issues in the period (3,943; Table 1), 308 observations are dropped because we do not have any defaults for issues with a rating Aaa, Aa1 and Aa2, Ca, Caa2 and not rated, while 337 are dropped because we do not have defaults for firms with one-digit SIC code 6, i.e. firms operating in regulated industries.

significant. The main results are therefore driven by differences in credit screening abilities on the underwriting of corporate bonds with relatively high levels of credit risk (i.e. lower ratings).

V.b Alternative econometric specifications

In addition to the binary choice model presented above, we checked the robustness of our results using two alternative econometric specifications.

First, in order to account more carefully for the different duration of the bonds linked to the credit worthiness of each bond, we estimate a survival model by the method of proportional hazards regression first proposed by Cox (1972):

$$\lambda(t_i) = e^{-(\beta' x_i + \gamma D_i + \delta Z_i + \xi T_t)} \lambda_0(t_i) \qquad (2)$$

where: λ_0 is the 'baseline' hazard and all other explanatory variables are as indicated above. For defaulted bonds, we define the duration as the period from the date of issuance to the date of default; for non-defaulted bonds, as the period from the date of issuance to the date of repayment. As before, the specification includes, as deal control variables, issue's maturity, rating, size and gross spread with respect to the benchmark as well as time and issuer's industry dummies.

The results for the coefficient of the dummy for securities underwritten by banks reported in Panels C and D of Table 3 confirm the results obtained with the binary choice model. Similarly, they also confirm that the overall impact comes from the performance of low-rated securities (Panel D). The impact of the control variables are also unchanged.

Second, to correct for the possible bias induced by the use of a parametric specification of the probability of default linked to differences in the composition of the selected populations of deals according to the type of underwriter biasing our results, we adopt a propensity score matching method (Rubin, 1979).[24] In practice, we split our sample between bonds underwritten by banks ('treated' observations) and bonds underwritten by investment houses ('untreated' or 'control' observations), match each 'treated' observation with a set of 'untreated' observations chosen so as to be as similar as possible to the 'untreated' ones and then compare the probability of default between the two groups. The matching is based on the propensity score estimated from a first stage binary choice model using size, rating, maturity, gross spread over the benchmark and issuer's sector of economic activity as explanatory variables. The nearest neighbors approach is used.[25]

[24] These methods, first introduced in the medical sciences, are now becoming increasingly popular also in economics. They lend themselves naturally to our analysis, because they focus precisely on non-random selection. For a recent survey, see Blundell and Costa Dias (2002). The routine we used for estimations is PSMATCH2, a Stata module by Leuven and Sianesi (2003). For an early application to finance see Villalonga (2004).

[25] We found similar results using the kernel weights method suggested by Heckman et al. (1997).

Panel A of Table 4 shows that the probability of default for securities underwritten by Section 20 subsidiaries (the 'average treatment on the treated' in the column labeled 'treated') is larger than for securities underwritten by investment banks (the 'average treatment on the treated' in the column labeled 'controls') and the difference is statistically significant.[26] Even stronger results are obtained for low-grade (i.e. with higher credit risk) securities, but the difference between the two effects is not statistically significant (panel B). Finally, for higher-grade (i.e. low credit risk) securities (panel C), the average treatment effect for 'treated' observations is equal to 0.04, which is almost double than for the control sample (0.023), and it is statistically significant.

V.c Discussion

In summary, the results obtained with all three statistical methodologies presented above lend strong support to the view that securities underwritten by the commercial bank securities subsidiaries have a higher probability of default than those underwritten by investment houses. This is in contrast with the certification hypothesis, according to which commercial banks are able to screen credit quality relatively better than other institutions before passing the underwritten securities through to investors.

Our results are consistent with findings of Kang and Liu (2007), who do not find a certification view of bank underwriters. Instead they show that banks that are more rapidly expanding their underwriting business face a greater need to provide investors with high-reward investment opportunities and discount the prices of bonds in order to attract potential investors

They are also related to those by Ber et al. (2001), who suggest that that fund managers are able to find and to exploit "naïve" or "unsuspecting" retail investors who are not able to distinguish and fully price ex-ante the impact of institutional underwriting (i.e. whether the securities were underwritten by banks or investment houses) on ex-post credit quality.

However, the baseline results presented above provide no clear explanation of the reasons why securities underwritten by banks are ex-post more likely to default than those underwritten by investment houses. In particular, it is not clear whether this depends on the presence of conflicts of interests or on other reasons leading banks to underestimate credit risk. In the following, we discuss some possible alternative explanations of our results, by delving further into the characteristics of bonds issued by banks and investment houses.

[26] Standard errors are computed by bootstrapping with 200 repetitions and significance by using the bias-corrected confidence interval.

VI. Additional evidence

VI.a Ex-post defaults

As it was already apparent from the descriptive statistics, the difference between the probabilities of default of securities underwritten by banks and investment houses is more striking in the first part of our sample period, a result leading support to the risk underestimation hypothesis.

In Table 5 we split our sample between issues underwritten between 1991 and 1994 and those underwritten between 1995 and 1999. Consistent with the evidence reported in the descriptive statistics, the coefficient of the dummy for issues underwritten by banks stronger when estimated in the first part of our sample (Panel A), but it becomes statistically insignificant when estimated in the second part of the sample (Panel B). Further, Panel D and E confirm that also in this case the results are driven by the differences in credit screening abilities on the underwriting of corporate bonds with relatively high level of credit risk (i.e. lower ratings). These results suggest that, initially, the banks that were entering the underwriting business underestimated the credit risk of the more opaque securities (i.e., those with lower credit ratings). Since we control for rating in our regressions, risk underestimation took place within each rating bucket, and for given size and maturity. Ex-post, risk underestimation led to the higher default incidence of securities underwritten by banks. In the second part of our sample period, when banks had already gained a significant share of the market and reputational issues might have become more compelling, relative risk underestimation nearly disappeared.

Evidence obtained from splitting the sample in two periods might also consistent with the conflicts of interest hypothesis, if one assumes that banks initially underwrote securities for the borrowers that they knew best, for which the potential for conflicts of interest was stronger, and only later offered their services to a wider clientele.

To contrast this explanation we have further focused on a sub-sample of competitive issues, defined as those made by issuers that used both banks and investment houses as underwriters during our sample period (Kang and Liu, 2007). On one hand, it is more likely that banks take an aggressive strategy to gain new clients from investment houses within the group of more competitive issues, possibly requiring lower yields and therefore underpricing risk. On the other hand, it is less likely that banks have strong informational advantages with respect to investment houses on these issuers, since these clients are less reliant on strong relationships with a given financial intermediary. Finding that competitive issues underwritten by banks have a higher default incidence than those underwritten by investment house would therefore provide additional support to the risk underestimation hypothesis, in contrast to the conflict of interest hypothesis.

Table 6 shows that this is indeed the case. The coefficient of the dummy for bank underwriting in the sub-sample of competitive issues is positive and strongly significant (Panel

A), which is not the case for uncompetitive issues (Panel B). Panels D and E confirm once again that the general results are driven by the differences in credit screening standards or abilities on the underwriting of corporate bonds with relatively high level of credit risk (i.e. lower ratings).

Table 7 provides some additional results consistent with the risk underestimation and competition on "de novo" entrants hypotheses, showing that foreign banks, that are more likely to incur in risk underestimation or in a looser underwriting standards to gain market shares, have a much higher probability of underwriting securities that ex-post defaulted (Panel A).

Panel B looks instead at the impact of maturity at issuance on debt defaults and bank underwritings. In this respect, the literature emphasizes that under information asymmetry, credit quality of the issuer influences debt maturity (see Flannery, 1986, and Berger et al., 2005). Firms with lower credit quality are more likely to be forced by the market to issue short-term debt, to minimize moral hazard problems, while firms with higher credit quality would tend to issue long-term debt. Consistent this prediction, we find that the dummy for short term (below 5 years) securities underwritten by banks is significant, while that for longer term securities (above 10 years) was statistically insignificant. Also in this case, the evidence seems in contrast with the conflicts of interest hypothesis between underwriters and investors, since banks would be more willing to push longer-term low-quality securities to investors, gaining more time to recover their risky lending expositions.

VI.b Ex-ante conditions

In a seminal contribution, Gande et al. (1997) found that interest rates on securities underwritten by banks were significantly lower than those on securities underwritten by investment houses, a result providing strong evidence in favor of the certification hypothesis. While our results on ex-post defaults are clearly at odds with such hypothesis, it might still be the case that investors believed in banks' superior certification ability, and therefore accepted lower returns on the securities that they underwrote. Banks might have then exploited the investors' belief of their superior certification ability, and required lower interest rates on the issues that they underwrote, in order to attract new issuers.

We have tested this hypothesis verifying if the gross spread on securities underwritten by banks is significantly different from that on securities underwritten by investment houses, controlling for all the characteristics of the issue considered in the previous regressions. Table 8 shows that this is not the case (Panel A), neither distinguishing the effect on high-grade and low-grade securities (Panel B).[27] Interestingly, securities underwritten by foreign banks are instead required to pay a premium to investors (Panel C), although we already know from our previous analysis on the probability of default that this is insufficient to compensate for their

[27] Roten and Mullineaux (2002) find similar results analyzing a different sample than Gande et al. (1997).

higher riskiness, because in those regressions we did control also for the gross yield on the bond, and still estimated a positive and significant coefficient for the dummy of foreign banks.

Next, we ran a counterfactual exercise verifying if ex-ante spreads charged on those securities that eventually defaulted were higher than average. Effectively this would detect whether the market had some information on the credit risk which was included in the spreads but is not captured by our controls. Interesting, we find that this is indeed the case, as shown by the positive and significant coefficient of the dummy for issues that eventually defaulted (Panel D). However, this effect is common to all issues underwritten by both banks and investment houses, as shown by the insignificant coefficient of the term accounting for the set of defaulted issues underwritten by a Section 20 subsidiary.

VI.c Further controls

In a number of unreported regressions, available from the authors upon request, we have also checked some additional implications of the conflicts of interest and the risk underestimation hypotheses. First, we matched our information with those on syndicated lending obtained from Loanware, a commercial database provided by Dealogic, and we have singled the cases in which banks had an ongoing lending relationship at the time of the issue or had had one in the previous years but we do not find evidence suggesting that earlier lending relationships had an impact on our results.

Second, we verified if issues underwritten by banks were ex-ante riskier than those underwritten by investment houses, estimating a binary choice model for the probability that a security is underwritten by a bank. A possible explanation for the higher default rate on issues underwritten by banks – particularly for lower quality deals – is that the ratings assigned to those securities were systematically different from those of bonds underwritten by investment houses. This might happen for two different reasons, both assuming that commercial banks are unable to gather all the information necessary to fully discriminate between different securities. On the one hand, rating agencies might assume that commercial banks have an incentive to lower their screening incentives when underwriting securities. For instance, they might assume that there is an ex-ante conflict of interest and that some banks might misrepresent the issues' quality to sell it to unsuspecting investors. In this case, they would tend to assign de facto an inferior rating to bonds originated by commercial banks. In other words, rating agencies would apply a 'lemon' discount to issues underwritten by banks (Kroszner and Rajan, 1994). Alternatively, rating agencies might assign better ratings to securities underwritten by Section 20 subsidiaries of commercial banks because they believe that, on average, commercial banks are simply better at screening credit risk than investment houses, because they have private information on the issuer, as suggested by the certification effect.

Clearly a 'lemon' discount on bank-originated issues would not imply a bias in our results.[28] This, however, would not hold if the rating assignment process assumed the existence of a certification effect on the part of commercial banks. Under this second hypothesis, other things being equal, bank-originated securities would then be assigned better ratings than those originated by investment houses. Lower-grade issues underwritten by commercial banks would then be of relatively lower quality and, as such, would have a higher default rate. However, we found evidence against this hypothesis, since all the dummies rating buckets in the model estimating the probability that an issue is underwritten by a bank or by an investment house are statistically insignificant, suggesting that banks are not more likely to underwrite riskier securities than investment houses.

Third, following Gande et al. (1997), we used the residuals from the binary choice model on the probability that a security is underwritten by a commercial bank as a proxy for underwriters' private information, and we plugged them into our baseline specification for the probability of default. Their effect is statistically insignificant, suggesting that neither banks nor security houses made intentional use of private information, neither for certification purposes nor to exploit potential conflicts of interest.

Fourth, we verified if the progressive entry of banks in the security business affected the default rates. Since in all our previous specifications we included year dummies among the explanatory variables, we replaced them with the aggregate market share of banks in security underwriting. Our results remained unchanged.

Fifth, we checked whether the interest rates on bank underwritten securities were significantly lower from the averages for the subsamples of competitive issues, lower-grade issues, and issues underwritten before 1995, as it might have been the case if banks had purposely tried to use their market power to place bonds at lower prices, to gain market shares among issuers. In none of these cases the difference was statistically significant.

VII. Conclusions

Our results show that securities underwritten by banks have a significantly higher default rate than those underwritten by investment houses, and that this cannot be explained by ex-ante publicly available information on the characteristics of the issues or the issuers. This result is in contrast with the certification hypothesis, stating that banks benefit from informational economies of scope and therefore can assess more precisely the riskiness of the securities that they underwrite.

[28] In presence of a 'lemons market' discount, affiliate-originated issues would be systematically rated lower than issues underwritten by commercial banks and therefore, within each rating class, they should have on average a lower probability of default (see Kroszner and Rajan, 1994, pp. 822-823).

We have proposed two alternative explanations of our findings. First, following the very rationale for the Glass-Steagall Act, we posited that banks might exploit their private information and misrepresent the issues' quality to sell it to unsuspecting investors, possibly using the proceedings to pay back their own loans. However, we found no convincing evidence consistent with this hypothesis.

Second, we suggested that banks might have been induced to underestimated default risk in their search for market shares. We found evidence consistent with this hypothesis, especially for securities that were low-graded, issued by corporations that more aggressively searched for better conditions, and in the first years since the admission of banks into the security business. In other words, banks had to be initially more aggressive than investment banks houses in order to gain market share, and in pursuing this objective they might have loosened their credit standards excessively.

The recent crisis has revived the interest on the possible impact of the repeal of the Glass-Steagall Act on banks' incentives. Our results do not question the elimination of the barriers between investment and commercial banking proposed by the Glass-Steagall Act. Rather, they point to the possibly perverse effects of allowing for increased competition without complementing it with more intensive scrutiny at the supervisory level.

Partly due to de-regulation and partly due to financial innovation, the traditional bank lending and securities business have become increasingly intertwined (Thakor and Boot, 2009) and a number of investment banks have become systemic in nature. Hence further empirical evidence on the competitive dynamics in the investment banking business and its possible impact on risk-taking incentives is, to our mind, warranted. In particular, it would be interesting to know whether a more crowded market for investment bank business – including universal banks with access to deposits and central banking facilities – might impact banks' risk taking incentives. At the same time, it would be relevant to understand how commercial banks further involvement in securities business might be affecting their broad credit screening intensity in traditional lending activities.

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Table 1

Number and volume of securities issued by year, by type of underwriter and by default

The table gives the number and the total aggregate values of the securities in our sample. They are issued between January 1, 1991 and December 31, 1999, with maturity longer than December 31, 1999. It also includes the default rates in percentage of those securities according to whether they were underwritten by investment houses or commercial banks. Commercial bank underwritings are those by one of the Section 20 subsidiaries. Data on security issues are from the Thomson Financial Database, defaults are from Moody's Default Report. High-grade ratings are those classified by Moody's between Aaa and Baa1. Low-grade ratings are those classified by Moody's as Baa2 and below.

	Total market		**Market share of bank underwritings** *(in percentage)*		**Default rate** *(in percentage)*			
					Investment houses		**Banks**	
	Number of issues	Amount *(mill. $)*	Number of issues	Amount	Number of issues	Amount *(mill. $)*	Number of issues	Amount *(mill. $)*
Panel A: Total securities issued								
1985	81	11,460			32.1	26.3		
1986	289	43,633			17.6	15.6		
1987	195	50,122			23.1	31.5		
1988	150	37,977			14.7	12.6		
1989	139	41,146	2.2	0.8	15.4	10.3		
1990	104	21,061	1.9	4.4	3.9	4.2		
1991	259	57,740	13.5	18.2	4.5	4.2	8.6	11.3
1992	464	106,011	23.9	31.1	12.2	10.5	14.4	9.6
1993	624	156,595	25.3	29.2	11.2	9.4	14.6	14.7
1994	301	64,763	31.2	40.5	11.1	9.7	19.1	24.5
1995	329	84,394	42.9	49.5	8.0	7.8	7.1	4.3
1996	411	113,820	23.8	25.4	7.3	5.7	13.3	17.7
1997	321	115,048	16.5	22.0	4.9	3.7	9.4	5.0
1998	630	202,796	7.8	15.0	5.7	3.0	6.1	9.8
1999	604	275,378	17.1	35.4	8.8	12.8	8.7	6.4
91-99	3,943	1,176,544	21.4	28.9	8.3	7.6	11.9	10.3
85-90	958	205,400	0.5	0.6	17.7	17.4		
91-94	1,648	385,109	24.2	30.0	10.2	8.8	15.1	15.1
95-99	2,295	791,435	19.3	28.3	6.9	7.0	9.0	7.8
Panel B: High grade securities								
85-90	481	86,522	0.8	1.3	4.4	4.1		
91-94	828	193,209	19.2	22.0	3.3	3.5	1.3	4.5
95-99	1,120	414,865	18.8	32.1	4.3	4.0	5.7	4.4
91-99	1,948	608,073	18.9	28.9	3.9	3.8	3.8	4.5
Panel C: Low grade securities								
85-90	477	118,878	0.2	0.1	31.1	26.9		
91-94	820	191,901	29.1	38.0	18.2	15.6	24.3	21.4
95-99	1,175	376,570	19.9	24.1	9.5	9.8	12.0	12.6
91-99	1,995	568,471	23.7	28.8	12.8	11.5	18.2	16.5

Table 2

Securities issued and spread by type of underwriter, size, maturity, rating, type of issuer and sample periods

The table classifies the number and the total values of the securities in our sample – issued between January 1, 1991, and December 31, 1999, and with maturity longer than December 31, 1999 distinguishing between those underwritten by investment houses and by commercial banks, with a breakdown by size, original maturity, Moody's credit ratings, type of issuer and sample periods. Competitive issues are those made by issuers which used both banks and investment houses as underwriters during our sample period (Kang and Liu, 2007). Data on security issues are from Thomson Financial Database, defaults are from Moody's Default Report. "Bank issues" underwritings are those by one of the Section 20 security subsidiaries of commercial banks (i.e. deposit taking institutions with access to deposit insurance) listed in Cornett et al. (2002).

	Panel A: Investment house issues				Panel B: Bank issues				Panel C: Default rate	
	Non-defaulted issues		Defaulted issues		Non-defaulted issues		Defaulted issues		Investment houses	Banks
	Number	Spread *(basis point)*	Number	Spread *(basis point)*	Number	Spread *(basis point)*	Number	Spread *(basis point)*	Number	Number
Total	2,845	110	256	333	742	105	100	292	8.3	11.9
Size										
Less than $75m	615	97	37	163	45	90	4	286	5.7	8.2
$75m to $300m	1,653	135	163	380	471	104	65	325	9.0	12.1
Greater than $300m	577	135	56	229	226	138	31	222	8.8	12.1
Maturity										
Less than 5 years	505	75	31	135	106	65	11	75	5.8	9.4
5 to 15 years	1,219	195	118	431	350	146	59	364	8.8	14.4
10 to 20 years	739	145	75	350	171	125	23	309	9.2	11.9
Over 20 years	382	96	32	154	115	98	7	118	7.7	5.7
Rating										
Non-rated	85	632			7	578				
Aaa	51	45			12	34				
Aa1- Aa3	827	66	16	165	185	58	5	47	1.9	2.6
A1- A3	555	95	45	151	151	90	9	106	7.5	5.6
Baa1- Baa3	474	132	33	155	167	118	26	113	6.5	13.5
Ba1- Ba3	238	253	41	270	88	239	18	292	14.7	17.0
B1- B3	599	446	113	469	130	445	42	462	15.9	24.4
Caa1- Caa2	16	604	8	645	2	695			33.3	
Type of issue										
Investment house client	1,849	195	197	390					9.6	
Bank client					290	173	47	400		13.9
Competitive issue	996	84	59	155	452	95	53	123	5.6	10.5
Sample period										
1991-94	1,122	105	128	389	338	115	60	360	10.2	15.1
1995-99	1,723	134	128	241	404	113	40	138	6.9	9.0

Table 3

Effect of type of underwriter on security defaults

Panels A and B presents the results of probit regressions of the probability of default of securities underwritten by investment houses and commercial banks, where the dependent variable is a dummy that takes the value of 1 if the security defaults (equation 1 in the text). Panels C and D present hazard ratios. They are the results of a survival-time data model by the method of proportional hazards regression developed by Cox (1972), where the dependent variable is the 'baseline' hazard based on the duration measured in months (equation 2 in the text). For defaulted bonds the duration is the period from the date of issuance to the date of default. For non-defaulted bonds the duration is the period from the date of issuance to the date of repayment. Time and industry dummies are included, although not reported. Data sources for each variable are described in the notes to tables 1 and 2. High-grade ratings (i.e. HI-grade) are those classified by Moody's as having rating included between Aaa and Baa1. Low-grade ratings (i.e. LO-grade) are those classified by Moody's as Baa2 and below. Bank underwritings are those by one of the Section 20 subsidiaries listed in Cornett et al. (2002). Heteroskedasticity robust standard errors clustered at the issuer level are reported in parentheses. The symbol *** indicates a significance level of 1 per cent or less; ** between 1 and 5 per cent; * between 5 and 10 per cent.

	Panel A:	Panel B:	Panel C:	Panel D:
Variables	Probit	Probit	Cox	Cox
Bank Underwriting	0.201 *		1.389 **	
	(0.111)		*(0.226)*	
Bank Underwriting * HI-grade		-0.022		0.876
		(0.210)		*(0.335)*
Bank Underwriting * LO-grade		0.279 **		1.545 **
		(0.130)		*(0.284)*
Size (log value)	0.022	0.026	1.046	1.054
	(0.054)	(0.*054*)	*(0.094)*	*(0.093)*
Gross spread	0.002 ***	0.002 ***	1.004 ***	1.004 ***
	(0.001)	*(0.001)*	*(0.001)*	*(0.001)*
No. of Observations	3,279	3,279	3,569	3,569
R-Square	0.273	0.274		

Table 4

Effect of type of underwriter on security defaults – Matching model

The table presents the results of a matching logit regressions of the probability of default of securities underwritten by investment houses and commercial banks (equation 3 in the text), splitting the sample by year of issue. The routine used for estimations is PSMATCH2, a Stata module developed by Leuven and Sianesi. (2003). The dependent variable is a dummy taking the value of 1 if the security defaults and 0 otherwise. The sources of the variable are described in the notes to tables 1 and 2. High-grade (i.e. HI-Grade) ratings are those classified between Aaa and Baa1 by Moody's. Low-grade ratings (i.e. LO-grade) are those classified by Moody's as Baa2 and below. Bank underwritings included as "treated" observations are those by one of the Section 20 subsidiaries listed in Cornett et al. (2002). The regression also includes calendar year, industry and rating dummies (not reported). Standard errors (reported in parentheses) are computed by bootstrapping, with 200 repetitions. The symbol *** indicates a significance level of 1 per cent or less; ** between 1 and 5 per cent; * between 5 and 10 per cent.

	Panel A: All Securities		
Variables	Treated	Controls	Difference
Average treatment effect on the treated	0.135	0.107	0.028 **
			(0.014)
No. of Obs. (common support)	3,024	741	
No. of Observations	3,049	747	

	Panel B: LO-Grade Securities		
Variables	Treated	Controls	Difference
Average treatment effect on the treated	0.225	0.189	0.036
			(0.025)
No. of Obs. (common support)	1,311	382	
No. of Observations	1,370	388	

	Panel C: HI-Grade Securities		
Variables	Treated	Controls	Difference
Average treatment effect on the treated	0.040	0.023	0.018 *
			(0.013)
No. of Obs. (common support)	1,643	349	
No. of Observations	1,657	359	

Table 5

Effect of type of underwriter on security defaults – Split by sample period

Panel A reports the results of estimating the probit specification (equation 1 in the text) separating the bonds issued between 1991-94, while Panel B reports the results of estimating the probit specification (equation 1 in the text) separating the bonds issued between 1995-99. The column Difference test is the value of a test for the hypothesis that the coefficients of the regression are equal for the two subsamples, that is distributed as a χ^2 with 1 degree of freedom. Data sources for each variable are described in the notes to tables 1 and 2. High-grade ratings (i.e. HI-grade) are those classified by Moody's as having rating included between Aaa and Baa1. Low-grade ratings (i.e. LO-grade) are those classified by Moody's as Baa2 and below. Bank underwritings are those by one of the Section 20 subsidiaries listed in Cornett et al. (2002). Heteroskedasticity robust standard errors clustered at the issuer level are reported in parentheses. The symbol *** indicates a significance level of 1 per cent or less; ** between 1 and 5 per cent; * between 5 and 10 per cent.

	Panel A:	Panel B:	Panel C:
Variables	1991-94	1995-99	Difference test (first vs. second period)
Bank Underwriting	0.264 *	0.106	0.56
	(0.152)	(0.163)	
Size (log value)	-0.031	0.093	1.08
	(0.098)	*(0.069)*	
Gross spread	0.003 ***	0.002 ***	0.66
	(0.001)	*(0.001)*	
No. of observations	1,238	1,783	
R-Square	0.276	0.352	

	Panel D:	Panel E:	Panel F:
Variables	1991-94	1995-99	Difference test (first vs. second period)
Bank Underwriting * HI-grade	-0.365	0.142	1.97
	(0.380)	*(0.259)*	
Bank Underwriting * LO-grade	0.403 **	0.087	1.60
	(0.172)	(0.198)	
Size (log value)	-0.028	0.092	0.99
	(0.099)	(0.069)	
Gross spread	0.003 ***	0.002 ***	0.68
	(0.001)	(0.001)	
No. of observations	1,238	1,783	
R-Square	0.282	0.352	

Table 6

Effect of type of underwriter on security defaults – Split by type of issuer

Panels A and B report the results of estimating the probit specification (equation 1) of the paper separating the bond issues between competitive (those whose issuers have issued at least one bond underwritten by both investment houses and banks during the sample period) and uncompetitive. The column Difference test is the value of a test for the hypothesis that the coefficients of the regression are equal for the two subsamples. Data sources for each variable are described in the notes to tables 1 and 2. High-grade ratings (i.e. HI-grade) are those classified by Moody's as having rating included between Aaa and Baa1. Low-grade ratings (i.e. LO-grade) are those classified by Moody's as Baa2 and below. Bank underwritings are those by one of the Section 20 subsidiaries listed in Cornett et al. (2002). Heteroskedasticity robust standard errors clustered at the issuer level are reported in parentheses. The symbol *** indicates a significance level of 1 per cent or less; ** between 1 and 5 per cent; * between 5 and 10 per cent.

	Panel A:	Panel B:	Panel C:
Variables	Competitive issuer	Uncompetitive issuer	Difference test (competitive vs. uncompetitive)
Bank Underwriting	0.509 ***	0.068	4.10 **
	(0.136)	*(0.170)*	
Size (log value)	-0.009	0.185 ***	2.93 *
	(0.090)	*(0.069)*	
Gross spread	0.001	0.003 ***	1.52
	(0.001)	*(0.001)*	
No. of observations	1,068	1,923	
R-Square	0.279	0.323	

	Panel D:	Panel E:	Panel F:
Variables	Competitive issuer	Uncompetitive issuer	Difference test (competitive vs. uncompetitive)
Bank Underwriting * HI-grade	0.151	-0.185	0.39
	(0.215)	*(0.499)*	
Bank Underwriting * LO-grade	0.733 ***	0.110	5.81 **
	(0.183)	*(0.183)*	
Size (log value)	-0.008	0.191 ***	3.02 *
	(0.091)	*(0.070)*	
Gross spread	0.001	0.003 ***	1.77
	(0.001)	*(0.001)*	
No. of observations	1,068	1,923	
R-Square	0.286	0.335	

Table 7

Effect of Type of Underwriter on Security Defaults – Foreign banks and maturity

Panel A disentangles deals underwritten by foreign banks. Panel B describes the effect of maturity at issuance on defaults, including interaction terms for short (below 5 years), and long-term securities. For all panels the dependent variable is a dummy that takes the value of 1 if the security defaults (equation 1 in the text). Time, industry, maturity and rating dummies are included, although not reported. Variable sources are described in the notes to tables 1 and 2. Bank underwritings are those by one of the Section 20 subsidiaries listed in Cornett et al. (2002). Heteroskedasticity robust standard errors clustered at the issuer level are reported in parentheses. The symbol *** indicates a significance level of 1 per cent or less; ** between 1 and 5 per cent; * between 5 and 10 per cent.

	Panel A:		Panel B:	
Variables	Foreign		Maturity	
Bank Underwriting	0.188	*		
	(0.113)			
Bank underwriting * Foreign banks	0.995	***		
	(0.202)			
Bank Underwriting * short term			0.317	***
			(0.120)	
Bank Underwriting * long term			0.003	
			(0.166)	
Size (log value)	0.052		0.021	
	(0.051)		*(0.055)*	
Gross spread	0.002	***	0.002	***
	(0.001)		*(0.001)*	
No. of Observations	3,279		3,279	
R-Square	0.286		0.274	

Table 8

Effect of Type of Underwriter and deal characteristics on Spreads

Panels A to D present the results of the regressions of the regressions on the gross spreads of the security at issuance with respect to the benchmark with the probabilities of being underwritten by a bank (i.e. bank underwriting, dummy equal 1) or by investment houses (dummy equal 0). Maturity dummies for short, medium and long term maturity refer to maturities at issuance of below 5, between 5 and 10 and above 10 years respectively. High-grade ratings are those classified by Moody's between Aaa and Baa1. Low-grade ratings are those classified by Moody's as Baa2 and below. The dummies defaulted refers to all securities than eventually defaulted. Time, industry and rating dummies are included where applicable, although not reported. Variable sources are described in the notes to tables 1 and 2. Bank underwritings are those by one of the Section 20 subsidiaries listed in Cornett et al. (2002). Heteroskedasticity robust standard errors clustered at the issuer level are reported in parentheses. The symbol *** indicates a significance level of 1 per cent or less; ** between 1 and 5 per cent; * between 5 and 10 per cent.

	Panel A	Panel B	Panel C	Panel D	
Variables					
Bank Underwriting	-1.577		-1.565	-2.364	
	(3.242)		*(3.236)*	*(3.098)*	
Bank Underwriting * HI-grade		-2.676			
		(2.490)			
Bank Underwriting * LO-grade		0.680			
		(5.668)			
Bank underwriting * Foreign banks			6.951		
			(11.180)		
Defaulted				28.899	***
				(8.862)	
Defaulted * Bank underwriting				-0.375	
				(12.483)	
Size (log value)	-0.538	-0.537	-0.400	-0.425	
	(1.334)	*(1.335)*	*(1.357)*	*(1.358)*	
No. of Observations	3,587	3,587	3,587	3,587	
R-Square	0.841	0.841	0.841	0.841	